

ASOS MODIFICATION NOTE 65 (for Electronics Technicians)

Engineering Division

W/OSO321: WDW

SUBJECT	: Installation of a Universal Power Supply (UPS) in a Small Class I Data Collection Package (DCP) Cabinet (P/N 62828-40070-20)
PURPOSE	: To provide a back-up AC power source.
EQUIPMENT AFFECTED	: The UPS will be tied electrically between the incoming facility AC power and the power distribution assembly (PDA) to the DCP.
PARTS REQUIRED	: Field Modification Kit (FMK): S100-FMK126
MOD PROCUREMENT	: Washington Central Support will issue one UPS to each Class I DCP that does not yet have a UPS installed.
TOOLS REQUIRED	: Maintenance Note 46 - UPS configuration table #1 Flat blade screwdriver #1 Phillips screwdriver #2 Phillips screwdriver 1" adjustable wrench 5/8" socket wrench Crimping tool (58078-3) with die (58080-1) Pliers Pipe wrench for 1-1/2" conduit fittings 9/16" socket wrench 1/2" drill and 7/8" drill bit 3/8" drill and 5/32" drill bit Hack saw Wire nuts to accommodate a single 14/16-gauge wire
RECOMMENDED TOOLS	: AMP pin extractor tool (P/N 843473-1) AMP pin insertion tool (P/N 91002-1)
TIME REQUIRED	: 8 Hours
SPECIAL INSTRUCTIONS	: Modification Note 52, DCP Solid-State Time Delay Relay (SSTDRL) Installation, must be installed prior to this modification.
EFFECTIVITY	: Sites listed in appendix A.
CERTIFICATION STATEMENT	: This modification is authorized by the following ECPs: 98SM05F225, S00949, S00947, S01100, S01099, S01083. This modification note has been tested at MTO, UNO, BPI, CLM, FHR, and LWV.

GENERAL

This modification contains procedures to install a Deltec PowerRite Pro II UPS (model # 05144188 A), an auxiliary (AUX) box, and UPS bypass circuitry for a 30" wide DCP cabinet (P/N 62828-40070-20). The UPS provides back-up AC power to the DCP in the event of intermittent or total facility power loss. Back-up power is provided to the UPS by a 48-volt battery pack which the UPS monitors and maintains an optimal charge under normal operating conditions.

NOTE:

This modification note recommends using AMP pin insertion and extraction tools to assist with wire connections to the versa module euro (VME) backplane. These two tools are not provided with this FMK and are not stocked by the NWS. They should be purchased locally or contact your regional focal point for assistance.

PROCEDURE

The following instructions outline procedures for installation of the UPS.

NOTE:

Ensure SSTDR (K1) has been installed inside the DCP prior to performing this modification. If not, Modification Note 52 must be performed at this time.

BEFORE INSTALLATION OF THE UPS

1. Call the Automated Surface Observing System (ASOS) Operations and Monitoring Center (AOMC) at 1-800-242-8194, and provide notification on which ASOS the UPS will be installed.
2. Get approval of the responsible meteorologist-in-charge (MIC)/official-in-charge (OIC)/observer before starting installation. Installation of the UPS may be performed on any day of the month if restrictions in steps 3 and 4 are satisfied.
3. **Commissioned Sites Only:** Do not start installation during inclement weather, precipitation, instrument flight rule conditions, or if any of those conditions are expected within 3 hours. The responsible MIC/OIC/observer will define these meteorological conditions.
4. Do not start UPS installation at a time that will conflict with scheduled synoptic observations at 00, 03, 06, 09, 12, 15, 18, and 21Z. Allow 8 hours to complete the installation and restart the ASOS.
5. Immediately before beginning work at the National Weather Service (NWS)-staffed sites, the MIC/OIC/observer will inform the air-traffic control tower (ATCT) and other critical users the ASOS will be turned off for the DCP upgrade. At an unstaffed site, the electronics technicians will inform the ATCT using controller video displays and operator interface devices (OID) that sensor data will be missing during this modification.

6. Do not begin the installation process until immediately after an hourly observation has been transmitted. At NWS-staffed sites, normal back-up observing procedures will be implemented.
7. At the OID, log on as TECH.
 - a. Key **MAINT - ACT - FMK** and enter MOD **65**.
 - b. Key **MAINT - ACT - FMK - START**.

INSTALLATION OF THE UPS IN A CLASS I DCP

WARNING

Ensure the AC power is completely removed from the DCP. DEATH OR SEVERE INJURY may result if power is not completely removed from the DCP prior to starting work on this modification.

CAUTION

Modification Note 52 must be installed in the DCP before the UPS bypass kit can be installed. Firmware revision 2.60 or higher must be present in the ACU memory card for ASOS to monitor this change.

1. Open the DCP cabinet and switch OFF the primary module circuit breaker 2A1A3A1.
2. At the AC junction box, open the junction box and switch OFF the circuit breaker labeled DCP.
3. Using 1-1/2" greenlee knockout punch, make two holes in the bottom of the DCP enclosure to receive the liquid-tight conduit connection from the AUX box. Refer to figure 1.

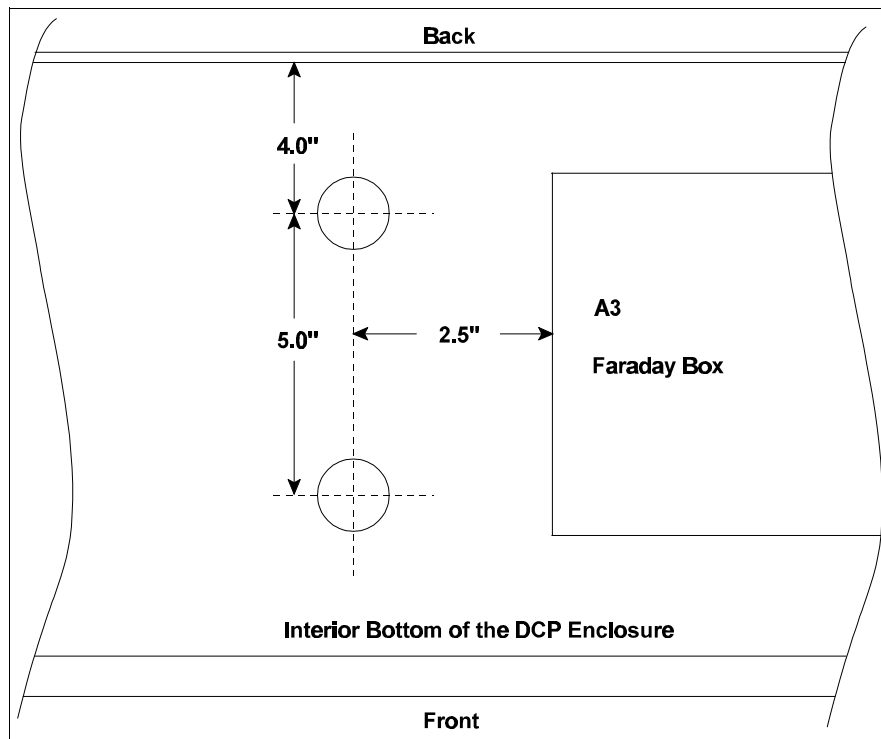


Figure 1 DCP Conduit Hole Locations

4. Install the AUX box on the DCP mounting poles directly behind the DCP enclosure. Refer to figure 2.
 - a. Attach the 6-foot ground wire to the AUX box mounting hardware as shown in view A-A of figure 2, and attach the other end to the installation ground wire running below the DCP enclosure using the split bolt provided in the FMK.
 - b. Connect the liquid-tight conduit between the 2" hole nearest to the AUX box side and the 2" hole closest to the door of the DCP. Connect another conduit between the remaining 2" holes.
 - c. Plug unused holes in the AUX box enclosure using the two 1" and one 3/4" knockout sealing caps provided in the FMK.

NOTE

A wiring diagram for this modification is provided in figure 12.

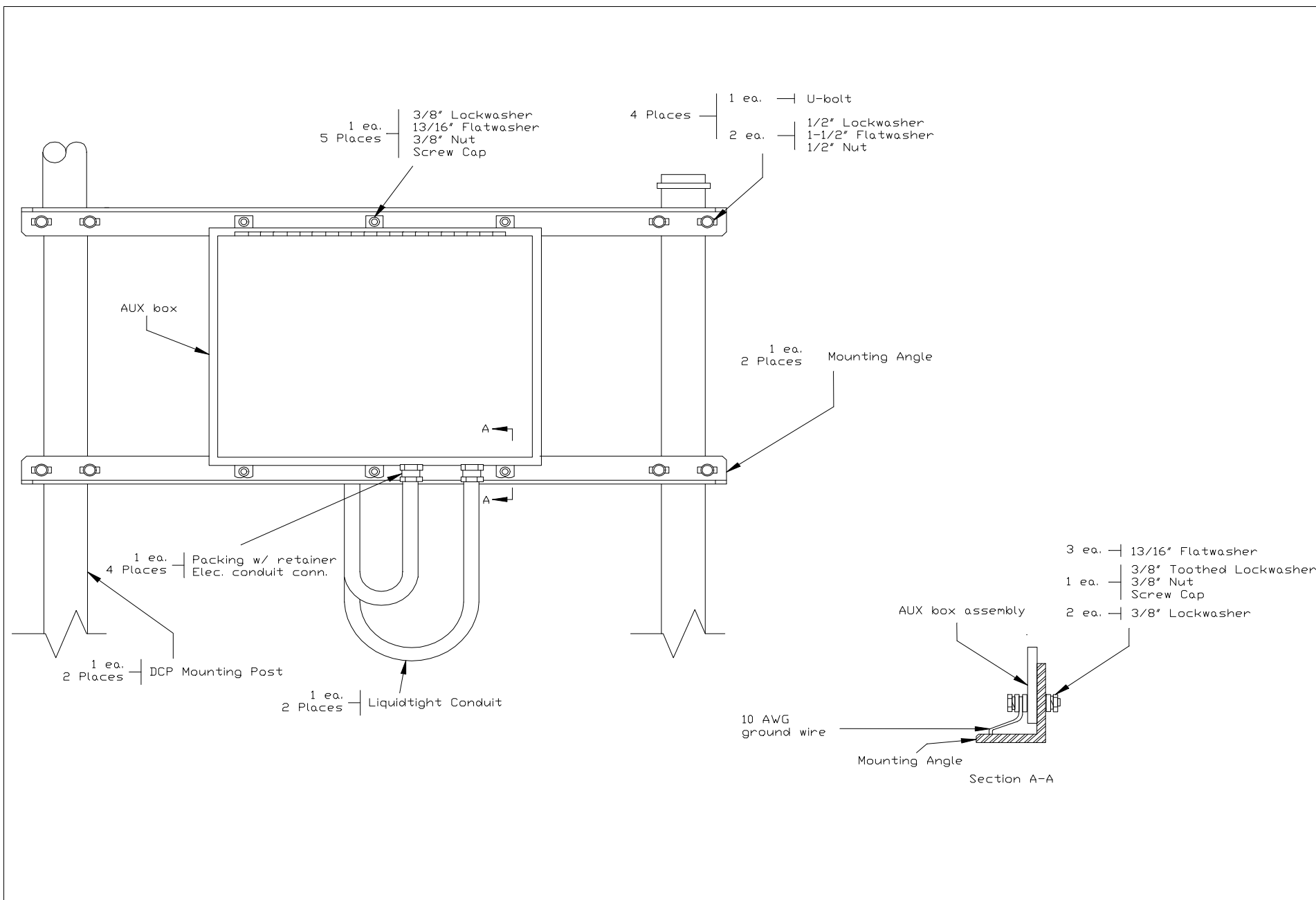


Figure 2 Auxiliary Box Installation

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5. Inside the DCP, open the faraday box and remove the cover at the connector position marked for J10. Install the power filter connector at 2A3J10.
6. Supplied in the FMK, cut 2-foot lengths each from the gray, white, and green wires. Apply the wire markers and receptacle contacts to the 2-foot lengths as illustrated in figure 3.

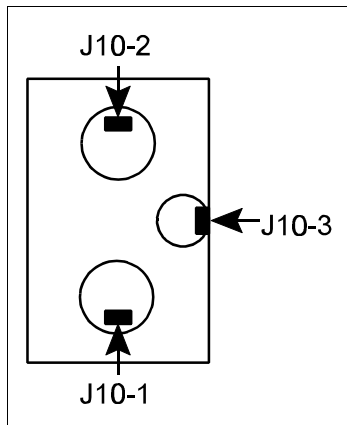


Figure 4 Filter Pins

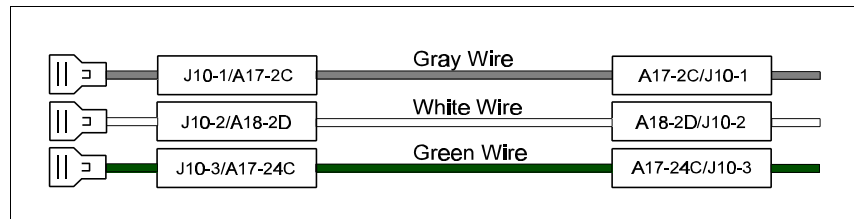


Figure 3 UPS Filter Wiring

7. Attach the receptacle contact ends of the UPS filter wires to the power filter. Refer to figure 4. Connect opposite ends of these wires to the AC distribution strips 2A3A17 and 2A3A18 as indicated by their wire markers.
8. Spot tie any loose wires and close the faraday box.
9. Unfasten the screw at the top of the circuit breaker rack, 2A1A3, and lower the assembly. Continue by detaching the safety lanyard from the right side on the circuit breaker rack and *gently* rest the rack on the edge of the DCP cabinet.
10. On the PDA, 2A1A4, remove the white jumper wire from 2A1A4-9B and 2A1A4-17C.
11. Locate the wire which runs from 2A1A9K1-4 to 2A1A4-12A (was installed in Modification Note 52, page 5, step 8d). Disconnect the wire end from the PDA and relabel with wire marker A1A9XK3-2. Attach this wire end to A1A9XK3-2.

NOTE

To make the wiring of the UPS bypass circuit easier, dismount the SSTDR and din rail (2A1A9) from the DCP backplate (2A1).

12. Install the K3 relay onto the XK3 socket. Attach the wire retainer to the XK3 socket and over the K3 relay. Refer to figure 5.

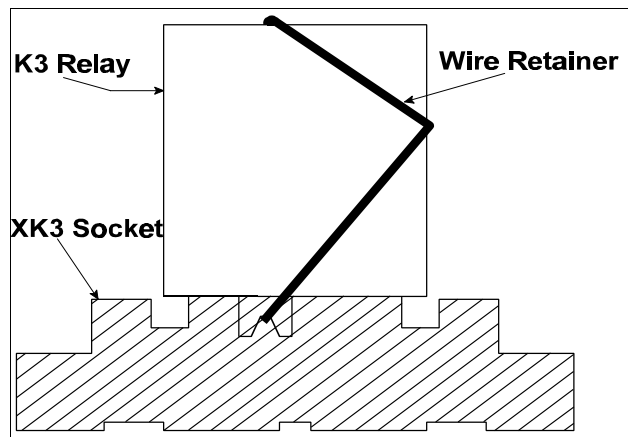


Figure 5 High Power Relay - Side View

13. Slide the digital input/output (I/O) module K2 and high-power relay XK3 onto the din rail next to the power reset kit (K1). Install the end clamps on each side of the UPS bypass assembly. Refer to figure 6.

14. Perform the following wire connections listed in the following table:

FROM WIRE BUNDLE	WIRE LABEL	CONNECT TO
W131	A1A9K2-1/A1A9XK3-5	K2-1
	A1A9K2-2/A1A9XK3-A	K2-2
	A1A9XK3-5/P33-1 A1A9XK3-5/A1A9XK2-1	XK3-5
	A1A9XK3-6/P33-2 A1A9XK3-6/A1A9XK3-B	XK3-6
	A1A9XK3-1/A2XA12P2-B2	XK3-1
	A1A9XK3-2/A1A9K1-4 ¹ A1A9XK3-2/P45-1	XK3-2

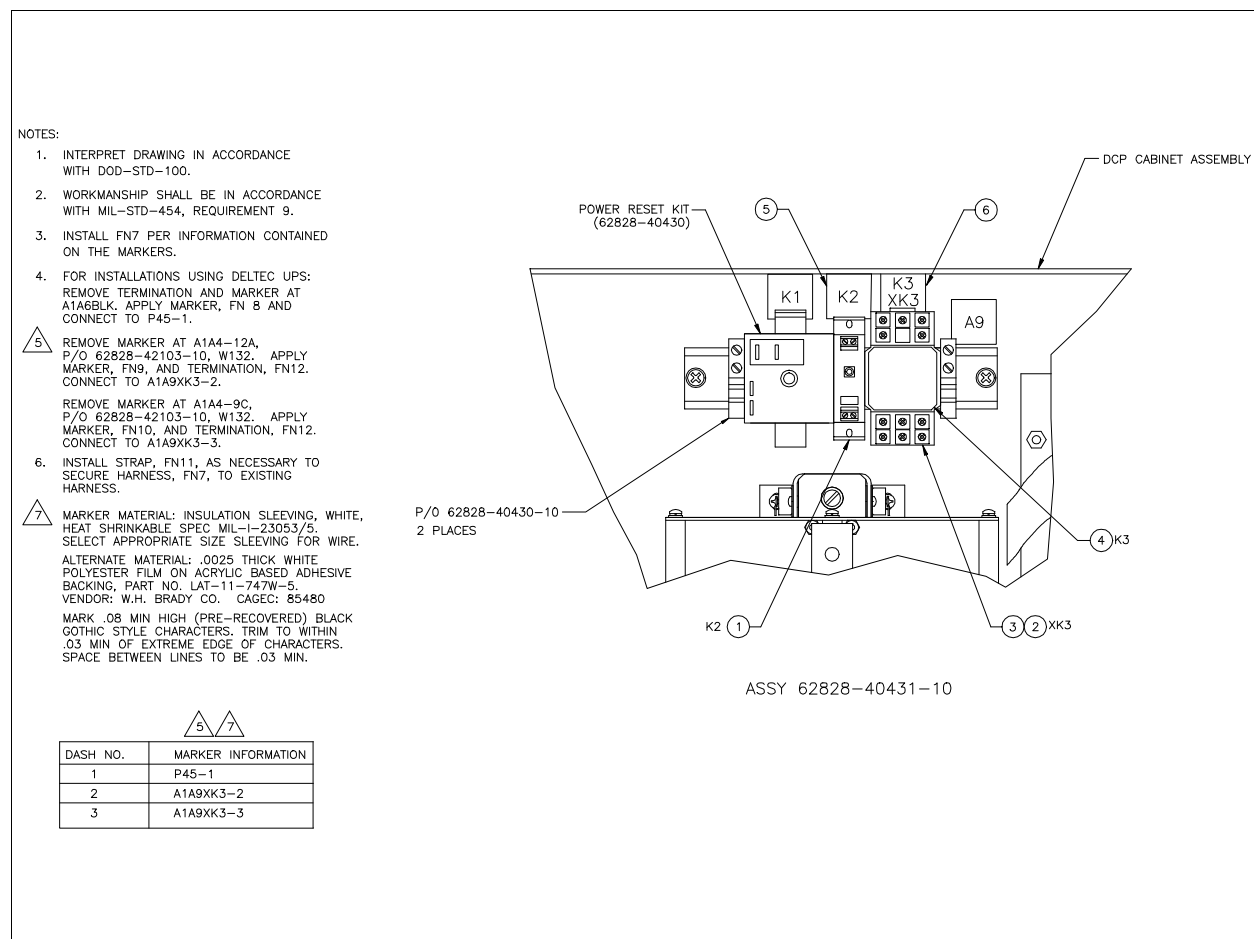


Figure 6 UPS Bypass Assembly Components and Installation

¹ Relabeled wire from step 11.

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	A1A9XK3-3/A1A4-9C	XK3-3
	A1A9XK3-9/A1A4-17C	XK3-9
	A1A9XK3-8/A1A4-12A	XK3-8
	A1A9XK3-7/A2XA12P2-A23	XK3-7
	A1A9XK3-B/A1A9XK3-6	XK3-B
	A1A9XK3-A/A1A9K2-2	XK3-A
	A1A9K2-3/A2XA12P2-B1	K2-3
	A1A9K2-4/A2XA12P2-C8	K2-4

15. Reinstall the UPS bypass assembly din rail to the DCP backplate and install the UPS bypass labels above each module as shown in figure 6.
16. Route the UPS bypass wire harness, W131, along the existing harness in the cabinet running from 2A1A9 to the PDA (2A1A4). In the W131 wire harness, route the four thin, white wires to the back of the VME rack (2A1A2). Spot tie the new harness to the existing harness with cable ties to keep in place. More wiring will be added later; do not tighten the cable ties yet.
17. Take the remaining green wire length from step 6 and cut it into two equal lengths, approximately 2 feet. Using these two wires and the remaining 3-foot white wire length, also from step 6, install wire markers as illustrated in figure 7.

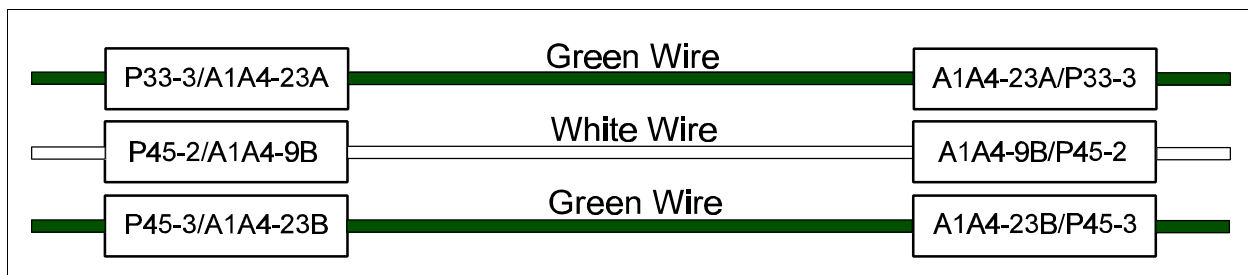


Figure 7 UPS Power Wires

18. In the wire bundle W131, remove the wire marker and terminator from the wire marked A1A6-BLK and reidentify with the P45-1/P3-1 wire marker. Remove the contact terminations from the wires labeled P33-2/A1A9XK3-6 and P33-1/A1A9XK3-5. Connect these wires and the wires from step 17 to an output receptacle and line cord connector. Refer to figure 8. This output receptacle will be referenced as W131P33 and the line cord connector will be referenced as W131P45.

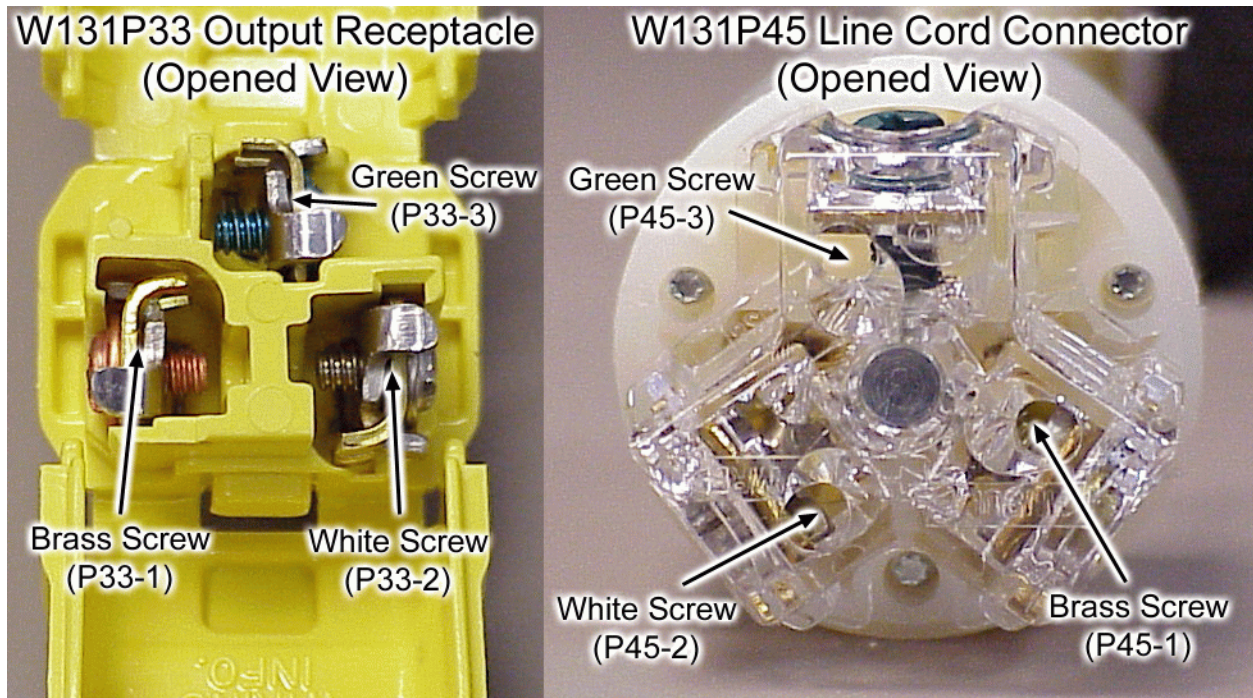


Figure 8 W131P33 and W131P45 Wiring Connections

19. From the AUX box, run the W111 (peripheral cable assembly) wire ends through the conduit opening closest to the side of the AUX box and into the DCP.

NOTE:

When making connections to the PDA, ensure the wires are not inserted too far into their terminals. If this occurs and the terminal screw is tightened down, the wire insulation may prevent proper contact from taking place.

20. Connect the following wires to the PDA. Check each connection made by giving a slight tug on the wire. Asterisks in the table below indicate multiple wire connections.

FROM WIRE BUNDLE	WIRE LABEL	CONNECT TO
W131	A1A4-12A/A1A9XK3-8	A4-12A
	A1A4-17C/A1A9XK3-9	A4-17C*
	A1A4-9C/A1A9K3-3	A4-9C*
W111	2A1A4-13B	A4-13B
	2A1A4-18B	A4-18B
	2A1A4-23B	A4-23B
Step 17	A1A4-23A/P33-3	A4-23A
	A1A4-9B/P45-2	A4-9B
	A1A4-23B/P45-3	A4-23B

21. Spot tie any loose wires using the cable ties. Reattach and secure the CB rack.

CAUTION

The harness attached to the VME rack will remain attached when removed from the DCP backplate. Care must be taken not to damage the wiring or terminations during the following operations.

22. Carefully remove the four nuts and associated washers that fasten the VME rack to the DCP backplate. Carefully lift the VME rack off the backplate, and gently rest it on top of the faraday box. The backplane connectors of the VME rack will now be accessible.

NOTE:

When inserting wires into the digital I/O connector terminal P2, orientate the wire connectors with the locking pin *down*. Be sure to listen for a “click” sound which will indicate the pin is seated properly inside the connector terminal.

23. Route the four 22-gauge white wires to the VME rack connector 2A1A2XA12P2, and insert them as illustrated in figure 9.

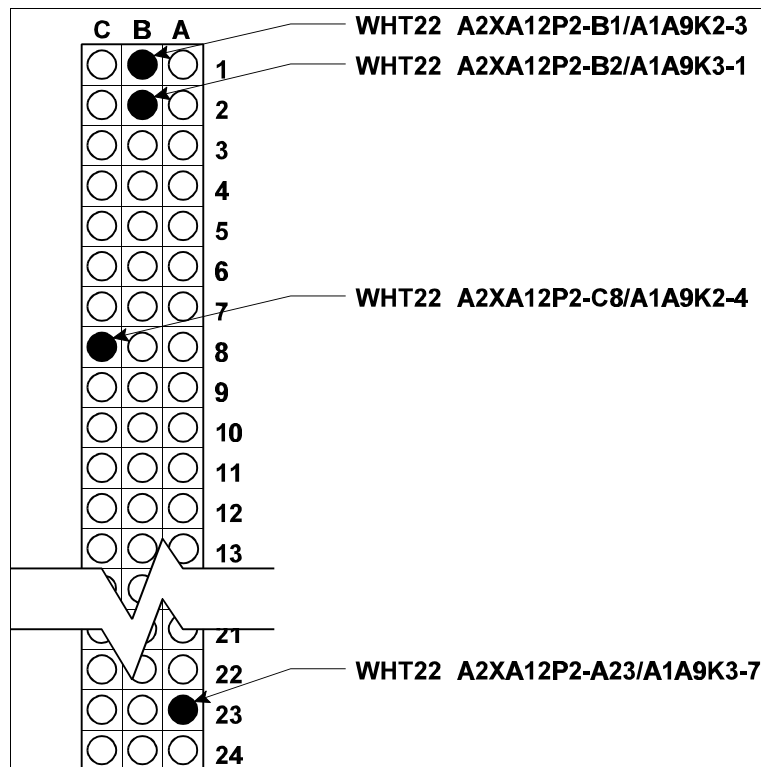


Figure 9 2A1A2XA12P2 Connections

24. While the back of the VME rack is exposed, check the tightness of the grounding wires and lug terminal on the VME backplane.
25. Carefully reattach the VME rack to the DCP backplate using the hardware removed in step 22.
26. Reinstall the digital I/O board into the VME chassis.
27. From the AUX box, run the branch of wire bundle W108 containing P1 and 2A1A4 terminations through the conduit opening closest to the side of the AUX box and into the DCP cabinet.
28. From the AUX box, run the branch of wire bundle W108 containing P5, P7, P10, P11, P13, and terminations marked for W15P37 through the conduit opening closest to the center of the AUX box and into the DCP cabinet.
29. In the DCP, locate W108P1 and plug it into the power filter 2A1A3J10.

30. In the DCP, locate the wires which run from W108P3 in the AUX box. Remove labels from the end of the wires marked for 2A1A4. Install new wire markers and connect them to an output receptacle which will be referred to as W108P45. Connect W108P45 to W131P45. Refer to figure 10.

WIRE COLOR	OLD WIRE LABEL	NEW WIRE LABEL	CONNECT TO
Gray	7A1A1A4-2B/P3-1	P45-1/P3-1	P45-1
White	7A1A1A4-10B/P3-2	P45-2/P3-2	P45-2
Green	7A1A1A4-22C/P3-3	P45-3/P3-3	P45-3

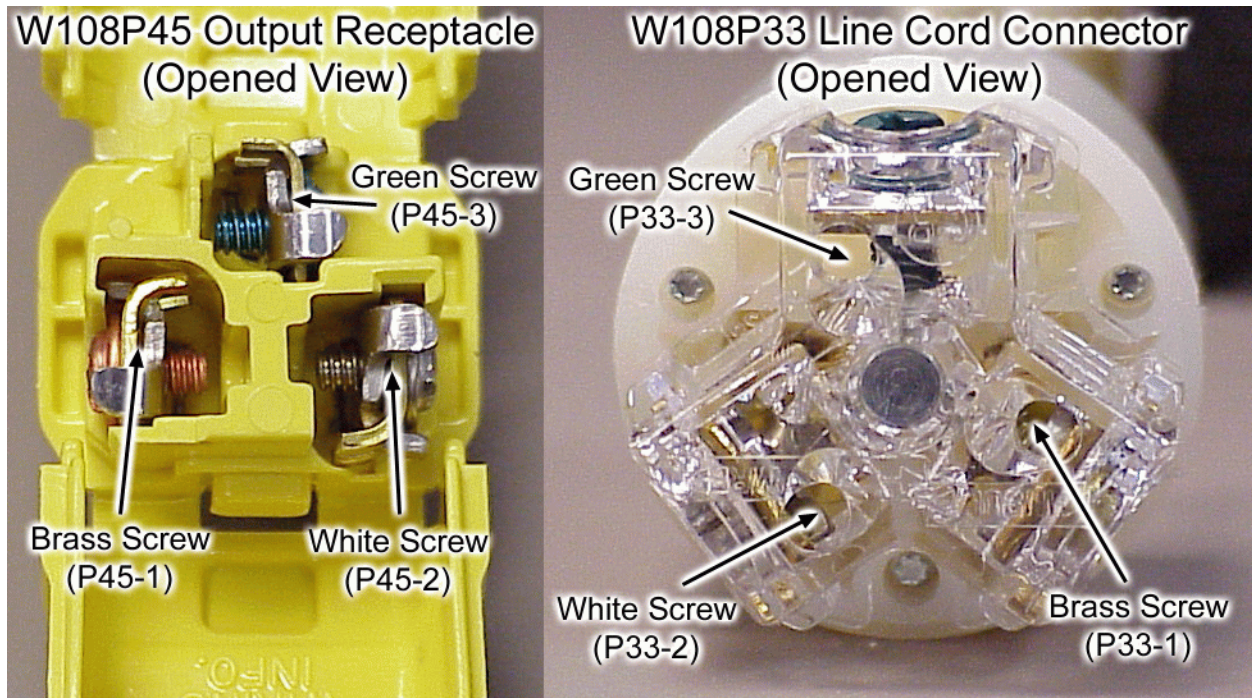


Figure 10 W108P33 and W108P45 Wiring Connections

31. In the DCP, locate the wires which run from W108P4 in the AUX box. Remove the labels from the end of the wires marked for 2A1A4. Install new labels and connect them to a line cord connector which will be referred to as W108P33. Refer to figure 10. Connect W108P33 to W131P33.

WIRE COLOR	OLD WIRE LABEL	NEW WIRE LABEL	CONNECT TO
Gray	7A1A1A4-14A/P4-1	P33-1/P4-1	W108P33-1
White	7A1A1A4-20A/P4-2	P33-2/P4-2	W108P33-2
Green	7A1A1A4-22D/P4-3	P33-3/P4-3	W108P33-3

32. Locate W17P37 in the DCP and insert the following wires:

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NOTE:

The color of the following wires will correspond to the connections made in the P37 connector.

WIRE LABEL	CONNECT TO
W106P29-11/A1A5S1-1	W17P37-11
W106P29-12/A1A5K1-4	W17P37-12

33. Locate W17P22 in the DCP and connect it to W108P5.

CAUTION

The battery box (with batteries) is heavy. Take care to avoid injury due to improper lifting or accidental dropping of the battery assembly. Batteries can be damaged by a short-circuit. Do not allow foreign material to enter the battery box connector.

34. Install the UPS kit into the AUX box. Refer to figure 11.

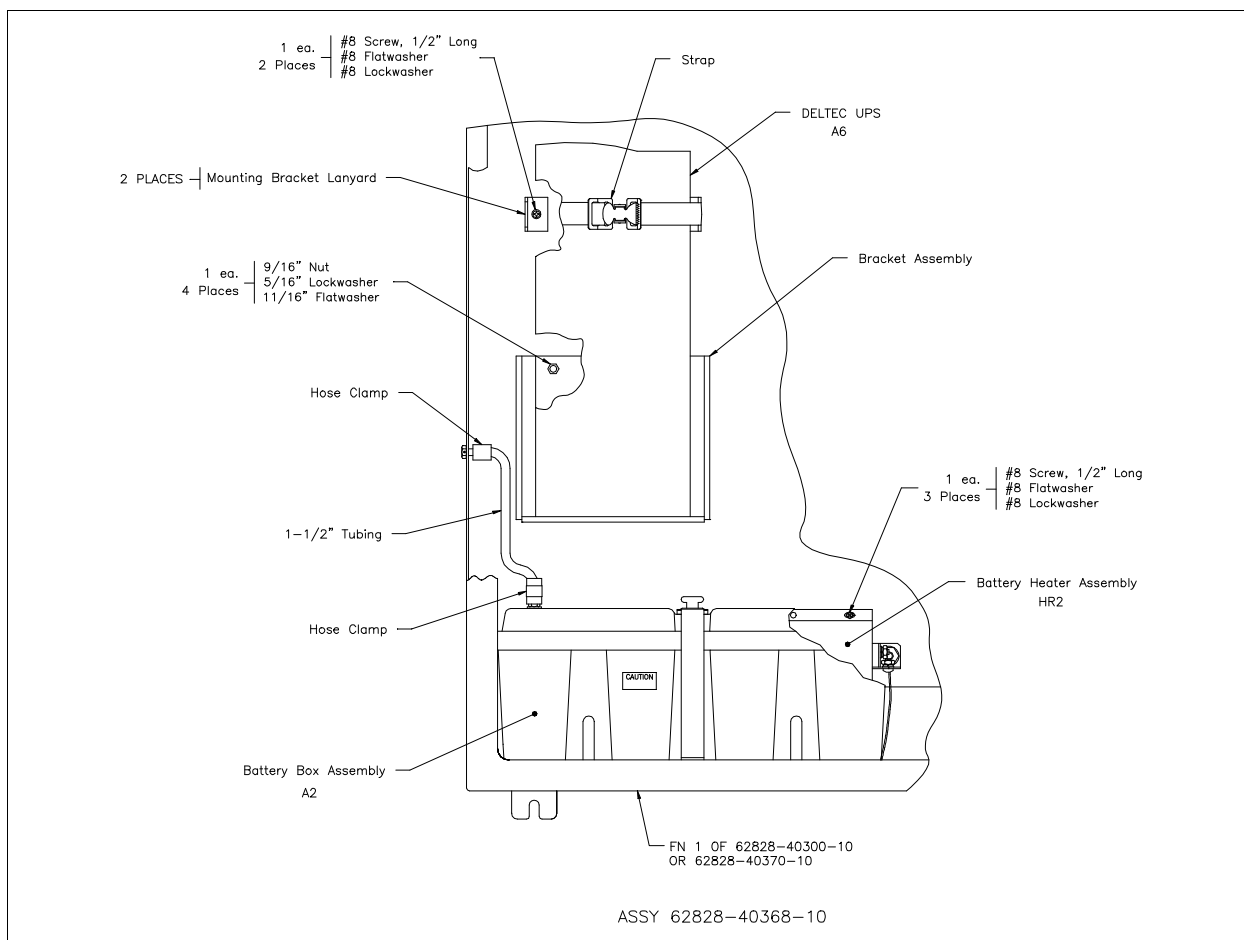


Figure 11 UPS Kit Mounting Location

35. Connect the following wires and connectors to the UPS kit.

Wire/Connector Label	Connect to
W108P2	A1P1 W15P44
W108P3	A1A6 INPUT
W108P4	A1A6 OUTPUT
W108P6	A1A6 COMM PORT
A2P1	A1A6 BATTERY PORT

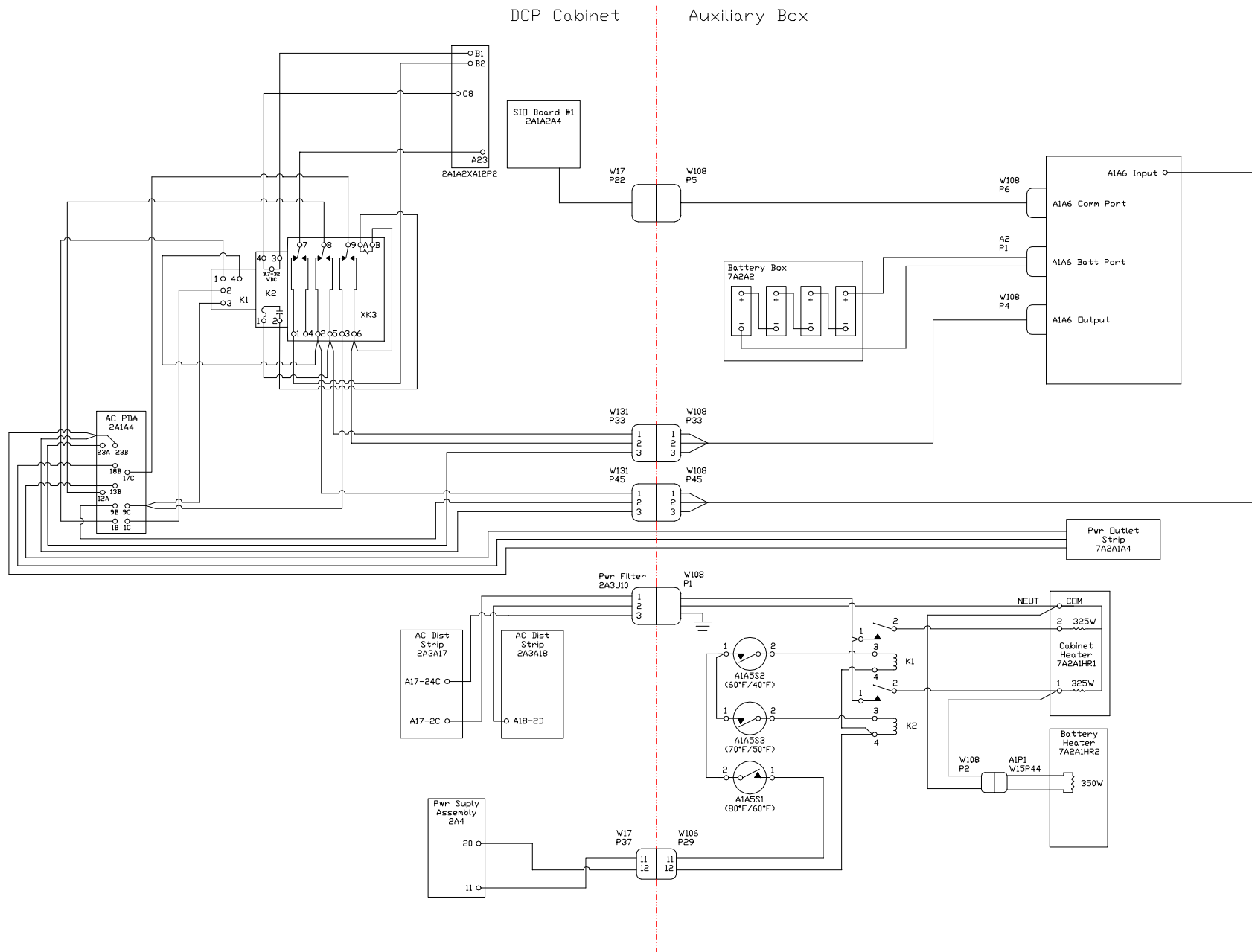


Figure 12 DCP AUX Box, UPS, and UPS Bypass Wiring Diagram

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SYSTEM CHECK OUT

1. At the AC Junction box, switch the circuit breaker labeled for the DCP to ON.
2. In the DCP, set the circuit breaker A1A3A1 to ON. On the front power panel of the UPS, switch the power switch to ON.
3. Before returning to the OID perform the following:
 - a. Verify the red LED on A1A9K2 is illuminated.
 - b. Using a voltmeter, verify that 115 VAC \pm 10% is present across pins A1A9XK3-A and A1A9XK3-B.
 - c. Verify the DCP is operational.
4. Return to the OID, and configure the UPS as outlined in Maintenance Note 46.

NOTE:

If firmware 2.60 was installed in conjunction with this modification note, a DCP download is required completing the following steps.

5. With the UPS configured, perform the following checks:
 - a. Key the following functions:
MAINT - SEL DCP - DCP UPS
Verify the UPS bypass status and command fields read:

►	UPS INLINE	P
►	CMD UPS INLINE	ON
 - b. Key **BYPAS**
After approximately 2 minutes, verify the UPS bypass status, command, and fail count fields read:

►	UPS INLINE	F	1
►	CMD UPS INLINE	OFF	
 - c. Return to the DCP, and verify the red LED on A1A9K2 is *NOT* illuminated. Using a voltmeter, verify *less than* 10 VAC are present across pins A1A9XK3-A and A1A9XK3-B.
 - d. Key **BYPAS**
After approximately 2 minutes, verify the UPS bypass status, command, and fail count fields read:

►	UPS INLINE	P	1
►	CMD UPS INLINE	ON	

6. Return to the DCP, and toggle the power switch on the rear panel of the UPS to OFF. The DCP should go to bypass mode and continue operating without a glitch. Wait approximately 2 minutes then restore power to the UPS once again.

7. Return to the OID, and verify the UPS bypass status, command, and fail count fields read:

▶	UPS INLINE	P	2
▶	CMD UPS INLINE	ON	

Review the SYSLOG, and verify error messages “DCP UPS OUTPUT DISABLED” and “DCP UPS BYPASSED” were issued.

8. Check the 12-HR sensor pages to ensure data is being collected from the sensors. Clear all failures on the MAINT page that were caused by powering the system down and proceed to “AFTER UPS INSTALLATION.”

AFTER UPS INSTALLATION

1. Contact the AOMC at 1-800-242-8194 and inform the operator of:

- a. Your location.
- b. The installation of the UPS kit and UPS bypass relay have been completed.

2. Enter in the SYSLOG that maintenance has been completed. Key the following functions: **MAINT - ACT - FMK**

For the FMK number, enter: **MOD 65**. On the second line of the screen, verify only MOD 65 is displayed. Complete by entering **Y** in the [Y/N] area if only MOD 65 is displayed.

3. Check the SYSLOG, and verify the FMK message. Enter a comment in the SYSLOG stating the UPS has been installed.

REPORTING MODIFICATION

Target date for completion of this modification is 45 days after receipt of parts. Report the completed modification on a NWS Form A-26, Maintenance Record, using the instructions in Engineering Handbook No. 4 (EHB-4), Engineering Management Reporting System (EMRS), part 2, appendix A. Report the modification to the DCP using the equipment code **ADCP** in block 7. Record a modification number of **65** in block 17a of the A-26.

See attachment **C** for a completed sample of WS Form A-26, Maintenance Record.

Original Signed

John McNulty
Chief, Engineering Division

Appendix A - Site Table
Appendix B - Parts List
Appendix C - A-26 Form

K:OSO321:B:Whisel:713-1833x156
File:k:\OSO32\OSO321\Asos Temps\Mod65.wpd
updated:4/28/00:5/8/00:spellchecked:5/2/00:5/8/00:src

Class I ASOS Sites to Install a UPS into the DCP			
Site ID	City, State	Region	Completed
ADG	Adrian, MI	Central	
BPI	Big Piney, WY	Central	Completed
HYR	Hayward, WI	Central	
IEN	Pine Ridge, SD	Central	
IOW	Iowa City, IA	Central	
ITR	Burlington, CO	Central	
LAA	Lamar, CO	Central	
LWC	Lawrence, KS	Central	
LWV	Lawrenceville, IL	Central	Completed
MIW	Marshalltown, IA	Central	
MTJ	Montrose, CO	Central	
MTO	Mattoon, IL	Central	Completed
PIL	Port Isabel, TX	Central	
PPF	Parsons, KS	Central	
RHI	Rhineland, WI	Central	
TQE	Tekamah, NE	Central	
UNO	West Plains, MO	Central	Completed
AFN	Jaffrey, NH	Eastern	
AQW	North Adams, MA	Eastern	
BJJ	Wooster, OH	Eastern	
BML	Berlin, NH	Eastern	
DNL	Augusta, GA	Eastern	
FIG	Clearfield, PA	Eastern	
FIT	Fitchburg, MA	Eastern	
FVE	Frenchville, ME	Eastern	
HIE	Whitefield, NH	Eastern	
IWI	Wiscasset, ME	Eastern	
IZG	Fryeburg, ME	Eastern	

MLT	Millinocket, ME	Eastern	
MVL	Morrisville, VT	Eastern	
ORE	Orange, MA	Eastern	
PHD	New Phildephia, OH	Eastern	
VSF	Springfield, VT	Eastern	
BPK	Mountain Home, AR	Southern	
CRS	Corsicana, TX	Southern	
CXO	Conroe, TX	Southern	
DCU	Decatur, AL	Southern	
DTO	Denton, TX	Southern	
GIF	Winter Haven, FL	Southern	
GVL	Gainesville, GA	Southern	
HKA	Blytheville, AR	Southern	
LEE	Leesburg, FL	Southern	
LVJ	Houston, TX	Southern	
RKP	Rockport, TX	Southern	
SWO	Stillwater, OK	Southern	
UTS	Huntsville, TX	Southern	
CLM	Port Angeles, WA	Western	Completed
FHR	Friday Harbor, WA	Western	Completed
RBG	Roseburg, OR	Western	

S100-FMK126 Small DCP UPS Installation - Alphabetical Listing		
Part Number	Quantity	Nomenclature
	1	Wire Marker: A1A4-9B/P45-2
	1	Wire Marker: A1A4-23A/P33-3
	1	Wire Marker: A1A4-23B/P45-3
	1	Wire Marker: A17-2C/J10-1
	1	Wire Marker: A17-24C/J10-3
	1	Wire Marker: A18-2D/J10-2
	1	Wire Marker: J10-1/A17-2C
	1	Wire Marker: J10-2/A18-2D
	1	Wire Marker: J10-3/A17-24C
	1	Wire Marker: P33-1/P4-1
	1	Wire Marker: P33-2/P4-2
	1	Wire Marker: P33-3/A1A4-23A
	1	Wire Marker: P33-3/P4-3
	1	Wire Marker: P45-1/P3-1
	1	Wire Marker: P45-2/A1A4-9B
	1	Wire Marker: P45-2/P3-2
	1	Wire Marker: P45-3/A1A4-23B
	1	Wire Marker: P45-3/P3-3
62828-40368-10	1	UPS Kit
62828-40370-10	1	Auxiliary Box Assembly
62828-40377-10	1	Power Filter Kit (J10)
62828-40431-10	1	UPS Bypass Kit
62828-90141-2	3	Insulated Crimp Receptacle
62828-90254-1	1	Split Bolt
62828-90272-1	1	Sealing Cap, 3/4"
62828-90272-3	2	Sealing Cap, 1"

APPENDIX B

62828-90344-1	2	Electrical Plug
62828-90345-1	2	Connector Body
Greenlee #75BB	1	1-1/2" Knockout Punch
M16878/5BKE8	1	3' Gray Wire, 14 AWG
M16878/5BKE9	1	5' White Wire, 14 AWG
M16878/5BKE5	1	6' Green Wire, 14 AWG
MS3367-4-9	12	Wire Tiedown Straps
QQW343S10S1B	1	6' Ground Wire
UPS Bypass Kit (62828-40431-10) Alphabetical Listing		
62828-40431-1	1	Marker No. 1 (P45-1)
62828-40431-2	1	Marker No. 2 (A1A9XK3-2)
62828-40431-3	1	Marker No. 3 (A1A9XK3-3)
62828-40439-4	1	Label, "K2"
62828-40439-5	1	Label, "K3 XK3"
62828-42102-10	1	DCP UPS Bypass Wire Harness (W131)
62828-90132-1	2	Spade Lug
62828-90428-1	1	High Power Relay (K3)
62828-90429-1	1	Digital I/O Module (K2)
62828-90430-1	1	High Power Relay Socket (XK3)
62828-90438-1	1	Wire Retainer, Relay
MS3367-4-9	12	Cable Ties
AUX Box Hardware Kit (62828-40429-10) Alphabetical Listing		
51026	1	Moly Dry Film Lubricant
62828-40068-1	2	Mounting Angle
62828-90096-3	9	Liquid Tight Conduit
62828-90097-3	4	Electrical Conduit Connector
62828-90293-3	4	Packing with Retainer
MS15795-814	8	13/32" ID x 13/16" OD Flatwasher

APPENDIX B

MS15795-817	8	1/2" ID x 1-1/2" OD Flatwasher
MS35308-364	6	Screw Cap
MS35335-63	2	3/8" Tooth Lockwasher
MS35338-141	7	3/8" Lockwasher
MS35338-143	8	1/2" Lockwasher
MS51972-3	6	3/8" Nut
MS51972-5	8	1/2" Nut
NAS3108C28-24	4	Bolt-U
UPS Kit (62828-40368-10) Alphabetical Listing		
62828-40266-10	1	Bracket Assembly
62828-90338-20	1	DELTEC UPS
62828-90341-3	1	Strap
62828-40263-1	2	Mounting Bracket Lanyard
62828-40223-10	1	Battery Heater Assembly
62828-40262-10	1	Battery Box Assembly
62828-90168-1	2	Hose Clamp
62828-90185-1	1	1-1/2' Tubing
MS51957-45	5	No. 8 Screw, 1/2" Long
MS15795-807	5	3/16" ID x 3/8" OD Flatwasher
MS35338-137	5	No. 8 Lockwasher
MS35649-2314	4	9/16" Nut
MS35338-140	4	5/16" Lockwasher
MS15795-812	4	11/32" ID x 11/16" OD Flatwasher

EMRS A-26 Form